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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

DEO, DUY VU NGUYEN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 07/28/2003

21

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/347,583

Applicant(s)

NI ET AL.

Examiner

DuyVu n Deo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 June 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13,23 and 24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3,5-13,23 and 24 is/are rejected.
- 7) ☒ Claim(s) 4 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

DETAILED ACTION

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

2. Claims 1-3, 5-9, 11-13, 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Miyoshi (US 5,660,673).

Miyoshi describes an apparatus for etching semiconductor wafer comprising: a lower electrode for supporting the wafer (claimed a chuck for supporting a wafer) (col. 5, line 19-26); a

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cylindrical ring (claimed barrier) having a first position relative to the wafer wherein the first position facilitates etch uniformity of material such as Al-Si-Cu using chemistry including C₂, BCl₃, and N₂ (claimed chemically driven etch process) (col. 5, line 25-37; col. 6, line 8-19); the barrier also has a second position, that does not interfere with the etch uniformity of material such as TiN using a plasma (claimed ion driven etch process) (col. 5, line 47-55; col. 6, line 20-27).

Referring to claims 2 and 3, in the first position, the barrier is raised above the wafer (figure 5a) and in the second position, the barrier 's top surface is not above the wafer top surface or below the wafer (col. 5, line 35-37; col. 6, line 20-25; figure 5b).

Referring to claims 5 and 12, the barrier surrounds the periphery of the wafer (col. 5, line 20-21) or the barrier shape is relative to the shape of the wafer.

Referring to claims 6 and 9, the barrier is raised or lowered by an air cylinder or a stepping motor (claimed actuator).

Referring to claim 7, figures 6a, 6b show the barrier has at least 3 positions.

Referring to claim 8, the barrier is raised to control the discharge of gas and products of reaction present on the wafer to ensure etch uniformity (col. 5, line 55-60). This would read on claimed of the first position is capable of restricting diffusion of gases over the wafer. The second position is when the ring is not projected above the upper surface of the lower electrode (claim 6, line 22). In this position, it would not substantially prevent the diffusion of gases over the wafer.

Referring to claim 11, the barrier includes an opening 9 (figure 4b).

Referring to claim 13, the cylindrical ring should be circular (col. 2, line 19).

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Referring to claim 23, the barrier is recessed in the second position so as not to disturb the plasma etching (ion-assisted etch) of TiN (col. 6, line 20-27).

3. Claims 1, 5, 8, 11, 23 are rejected under 35 U.S.C. 102(e) as being anticipated by Ohkuni et al. (US 6,210,593).

Ohkuni describes an apparatus comprising: a sample stage (claimed chuck) to support a wafer (col. 6, line 45); a movable rings 111 (claimed barrier) having a first and second position (col. 6, line 55-67). Wherein the first position, the barrier is decreasing the quantity of reactive radicals such as chlorine, to achieve equal etching rate at center and peripheral of the etched material (claimed capable of restricting diffusion of gasses over the wafer and facilitates etch uniformity for a chemically driven etch process) (col. 8, line 46-57) and in the second position, the barrier increases the quantity of reactive radicals, (or plasma etching) supplied to the peripheral portion of the wafer to achieve equal etching rate at center and peripheral of the etched material (claimed does not substantially prevent the diffusion of gases or does not interfere with etch uniformity of ion driven etch process) (col. 3, line 6; col. 8, line 33-45).

Referring to claims 5, 12, and 13, the barrier 111 surrounds the wafer and therefore its shape would have to be relative to that of the wafer. The barrier is a ring; therefore, it would be circular.

Referring to claim 11, figure 1 shows the barrier has an opening 109.

Referring to claim 23, the barrier is moving down (claimed recessed) so to increase the quantity of reactive radicals, or plasma, supplied to the peripheral portion (claimed so as not to disturb an ion-assisted etch) (col. 8, line 33-45).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyoshi or Ohkuni.

Applied prior art doesn't describe the barrier is within 1/8 to 2 inches of the wafer in the first position. However, Miyoshi teaches that the distribution of etching rate is in dependence on the projecting height of the barrier (col. 5, line 61-65) and Ohkuni also shows the gas distribution depends on the barrier position by moving it up or down (col. 8, line 34-57). Therefore, it would have been obvious for one skill in the art to determine the proximity of the barrier to the wafer through routine experimentation in order to control the discharge of gas and products of reaction on the wafer so that an etch uniformity can be achieved with a reasonable expectation of success.

6. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohkuni.

Unlike claim 24, Ohkuni doesn't describe the barrier is either flush with or below the upper surface of the focus ring in the second position. However, he teaches that the barrier would control the quantity of the reactive radicals by moving up or down (col. 8, line 33-57) and figure 1 shows the barrier 111 is capable of moving down to be flush with the focus ring 110. therefore, it would have been obvious for one skill in the to determine the second position, to be flushed with or below the focus ring, through routine experimentation depending on the quantity

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of reactive radicals being distributed over the wafer so that an equal etch can be achieved with a reasonable expectation of success.

Allowable Subject Matter

7. Claim 4 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 4 is allowable because applied prior art doesn't teach or suggest the chuck is moved (or capable of movable) to establish the first and second position of the barrier relative to the wafer.

Response to Arguments

8. Applicant's arguments with respect to claims 1-13, 23, 24 have been considered but are moot in view of the new ground(s) of rejection.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n Deo whose telephone number is 703-305-0515.

DVD
July 24, 2003

gd